

L 39255-66 EWT(M)/RWP(G)/RTI IJP(G) RW/JD/JG/WP

ACC NR: AP6015293

(N)

SOURCE CODE: UR/0365/66/002/003/0360/0361

AUTHOR: Gil'man, V. A.; Kolotyркиn, Ya. M.

ORG: Physicochemical Scientific Research Institute im. L. Ya. Karpov (Nauchno-issledovatel'skiy fiziko-khimicheskiy Institut)

TITLE: Pitting corrosion of zirconium in perchlorate solutions

SOURCE: Zashchita metallov, v. 2, no. 3, 1966, 360-361

TOPIC TAGS: corrosion, zirconium, perchlorate, chloride

ABSTRACT: A study of zirconium corrosion in 0.1 and 1.0 N NaClO_4 and HClO_4 and also 0.3 N LiClO_4 showed that under spontaneous dissolution and anodic polarization conditions, zirconium is in a passive state until a certain critical potential ϕ_{cr} is reached, at which extensive pitting begins to take place. In this respect, the anodic behavior of Zr in perchlorate solutions is similar to that in chloride solutions, except for the fact that in the latter the critical pitting potential is more positive by almost one whole volt. The value of ϕ_{cr} in perchlorate solutions is determined by the ClO_4^- concentration, increasing by 100 mV for a tenfold decrease of the perchlorate concentration, and, as in the case of chlorides, is independent of the solution pH or the anodic current density. Thus, halide ions are not the only ones to cause the pitting corrosion of zirconium; ClO_4^- ions also have this capacity (although not

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to the same degree), and the latter is not confined to Zr and Fe, but is more general in character. Orig. art. has: 2 figures.

SUB CODE: 11,07/ SUBM DATE: 24Jan66/ ORIG REF: 007

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L 35299-66 EWP(t)/ETI IJP(c) JD/WB/GG

ACC NR: AP6026820

SOURCE CODE: GE/0065/66/231/03-/0145/0150

AUTHOR: Kolotyrkin, Ya. M. (Professor; Doctor); Florianovitch, G. M.

ORG: L. Ya. Karpova Institute for Physical Chemistry, Moscow

TITLE: Temperature-dependence of the dissolution kinetics and of the passivation of metals and alloys. Part 2: Temperature-dependence of the dissolution mechanism

SOURCE: Zeitschrift fur physikalische Chemie, v. 231, no. 3-4, 1966, 145-150

TOPIC TAGS: reaction mechanism, chemical kinetics, cathode polarization, iron, chromium, iron alloy, chromium alloy, sulfuric acid, temperature dependence, corrosion

ABSTRACT: Cathodic and anodic polarization curves were obtained for iron, chromium, and alloys of these in sulfuric acid at various temperatures, and the curves were compared with those corresponding to the relation between potential and dissolution rate, to elucidate the temperature-dependence of the dissolution kinetics. It was shown that both electrochemical and chemical processes are involved in the dissolution mechanism, and that the mechanism can be steered to favor either way by appropriate adjustment in the reaction parameters. The principal parameters involved are potential and temperature. The significance of the findings in corrosion research was discussed. Orig. art. has: 5 figures.

JPRS: 36,464

SUB CODE: 07 20

SUBM DATE: 21Aug66 / ORIG REF: 003

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L 04770-67 EWT(m)/FWP(t)/ETI IJP(c) JD/WB/JH

ACC NR: AP6025724

SOURCE CODE: UR/0365/66/002/004/0488/0490

AUTHOR: Freyman, L. I.; Kolotyrkin, Ya. M.

ORG: Scientific Research Physicochemical Institute im. L. Ya. Karpov
(Nauchno-issledovatel'skiy fiziko-khimicheskiy institut)

TITLE: Pitting corrosion²⁷ of aluminum²⁷ in sodium perchlorate and hydrochloric acid solutions²⁷

SOURCE: Zashchita metallov, v. 2, no. 4, 1966, 488-490

TOPIC TAGS: aluminum, corrosion, corrosion rate, perchlorate, chloride, solution kinetics, electrochemistry

ABSTRACT: The behavior of aluminum in perchlorate- and chloride-containing solutions was studied to obtain data to help explain the action between perchlorate ions and different metals. Polarization curves were obtained for the aluminum. The curves in pure borate buffer solution (pH 7.4) and in 0.1 N Na₂SO₄ coincided at potentials from -0.5 to +0.5 v, showing no activation. The behavior was similar in 0.1 N NaClO₄ up to about -0.05 v, but as potential increased to -0.03 v, the current rapidly increased. Electrode pitting and gas evolution were noted. Al was activated in 0.1 N HClO₄ at a lower critical potential of

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-0.09 v. In the control 0.1 N NaCl activation was observed at 0.41 v. The relative ability, with respect to chloride, of bromide, iodide and perchlorate anions to activate passive metals ($\Delta\phi_{crit} = \phi_{crit}^{Cl} - \phi_{crit}^{An'}$, where $An' = Br', I', ClO_4'$) was found to increase in the series Fe, Al, Zr. $\Delta\phi_{crit}$ increased regularly in the order Br', I', ClO_4' , except for an anomalously high value for Fe in ClO_4' which was attributed to secondary activation. Orig. art. has: 1 table and 1 figure.

SUB CODE: 11,07/ SUBM DATE: 05Apr66/ ORIG REF: 012/ OTH REF: 002

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L 04777-67 EWT(m)/EWP(w)/EWP(t)/ETI/EWP(k) IJP(c) JD/WW/JG/WE

ACC NR: AP6025725

SOURCE CODE: UR/0365/66/002/001/0490/0492

AUTHOR: Gil'man, V. A.; Kolotyrkin, Ya. M.; Malkina, R. I.

ORG: Scientific Research Physicochemical Institute im. L. Ya. Karpov
(Nauchno-issledovatel'skiy fiziko-khimicheskiy institut)

TITLE: Solution of zirconium in concentrated hydrochloric acid

SOURCE: Zashchita metallov, v. 2, no. 4, 1966, 490-492

TOPIC TAGS: zirconium, corrosion, corrosion rate, electrochemistry,
solution kinetics, chloride, induction melting, metal melting

ABSTRACT: Studies of the corrosion and electrochemical behavior of zirconium under anodic polarization conditions were continued using concentrated HCl, 11.5 N. In the passive region, at potentials more negative than +0.17 v, the rate of Zr solution to Zr^{+4} is independent of potential and amounts to $0.2-1 \cdot 10^{-4}$ amp/cm². The rate of solution of Zr pre-etched in HF corresponds to the stationary anodic current density at the given potential. In the case of Zr with atmospheric oxide films, the initial average rate of solution is an order higher than the anodic current through the system, but becomes somewhat lower and almost constant with time. The proposed mechanism for the solution of passive

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SOURCE CODE: UR/0317/66/000/003/0050/0055

ACC NR: AP6030097

AUTHOR: Kolotyrkin, Ya. (Corresponding member AN SSSR; Director)

ORG: Physicochemical Institute im. L. Ya. Karpov, Academy of Sciences, SSSR (Fiziko-khimicheskii institut Akademii nauk SSSR)

TITLE: Weapons against corrosion

SOURCE: Tekhnika i vooruzheniye, no. 8, 1966, 50-55

TOPIC TAGS: corrosion, corrosion protection, corrosion resistance, corrosion inhibitor, *CORROSION RESISTANT METAL, BLAST FURNACE*

ABSTRACT: Corrosion damage to metals embracing nearly one eighth of the total production of blast and open-hearth furnaces, can be significantly reduced by applying effective modern means of providing protection against corrosion. Presented are methods for increasing the corrosion resistance of metals, including the processes of alloying, heat treatment, and the application of composite metals. Metal coatings, their application by electroplating, chemical, gas and plasma firing methods, and the use of lacquers, paints, and synthetics are discussed. The modern use of inhibitors for increasing the storability of metal products, cathodic protection, and a new electrochemical method of providing anodic protection, especially for application to ferrous metals in a neutral medium, are outlined. Effecting a

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decrease in the aggressive corrosion potential of the medium in question is also considered to be an effective means of fighting corrosion damage to metals. Orig. art. has: 3 figures.

SUB CODE: 11/ SUBM DATE: none

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ACC NR: AP6036106

(A, N)

SOURCE CODE: UR/0365/66/002/006/0628/0635

AUTHOR: Knyazhova, V. M.; Sumakova, I. S.; Kolotyarkin, Ya. M.; Kruzhkovskaya, A. A.

ORG: Physicochemical Scientific Research Institute im. L. Ya. Karpov (Nauchno-issledovatel'skiy fiziko-khimicheskiy institut)

TITLE: Anodic behavior of chrome-nickel steels stabilized with titanium

SOURCE: Zashchita metallov, v. 2, no. 6, 1966, 628-635

TOPIC TAGS: chromium steel alloy, nickel containing alloy, titanium, electrochemistry

ABSTRACT: The experiments were carried out on samples of Type Kh18N9T steel in a 1 N solution of sulfuric acid, at 70°, in an atmosphere of argon. In general, the polarization curves were taken for freshly purified samples which had not been subjected to previous cathode activation. In addition to the electrochemical measurements, the solutions were analyzed colorimetrically for Fe, Cr, and Ti, after the samples had been held at the given voltages. The sensitivity of the determinations was, respectively, 5×10^{-7} , 5×10^{-8} , and 2×10^{-7} grams/ml. It was concluded from the experimental data that titanium carbide, regardless of existing literature indications, cannot be recommended as an electrochemically stable anode. It follows also from the results of the present investigation that in the determination of the steady state anode potential curves, it is not necessary to take into account the

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ACC NR: AP6036106

change in the state of the surface of the steel, and in particular its chemical composition, as a function of the duration of the experiment. The electrochemical instability of titanium carbide is evidently one reason why steels stabilized with titanium have a lower corrosion resistance in oxidizing media, and an increased tendency toward pitting, in comparison to steels which do not contain titanium. "We acknowledge our deep indebtedness to M. A. Veneneyeva for help in carrying out this work." Orig. art. has: 6 figures and 2 tables.

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REEL #239

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to

KOLOTYR KIN, Y.A.M.

